DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D. C.

4 March 1959

MEMORANDUM FOR SAB GEOPHYSICS PANEL MEMBERS AND CONSULTANTS

SUBJECT: Material Pertinent to Panel Meeting 2-3 April 1959, Pentagon, Washington, D. C.

REFERENCE: Memorandum to the Geophysics Panel Members and Consultants Dated 26 February 1959 with attached Tentative Agenda.

1. Pursuant to above reference and, at the further request of Mr. Paul A. Smith, attached hereto as Inclosure 1 is a brief of important points for consideration during forthcoming Geophysics Panel activities. This brief has been prepared from a recent letter from Professor Haurwitz who submitted it in response to a query by the Chairman of the SAB for his views on matters of current and foreseeable concern to the Geophysics Panel. The basis for the query on which Professor Haurwitz has commented was a memorandum from the Military Director, SAB dated 29 December 1958 to the Chairman of the SAB, subject: Special SAB Activity During Calendar Year 1959.

2. With further reference to the aforementioned memorandum of 29 December 1958 your attention is invited to paragraph A thereof wherein problems posed are of direct interest to the Geophysics Panel, a copy of which is attached hereto as Inclosure 2.

3. Attached as Inclosure 3 is an additional particularly meaningful document prepared by Dr. Whipple. This document was brought to the attention of the SAB at the Ramey meeting on 22 October 1958 and is being forwarded as an official SAB position to the Chief of Staff, USAF and to other immediately interested Air Force authorities.

C O N F I D E N T I A L

Memo to Geophysics Panel dtd 4 Mar 59 (Cont)

4. It is the desire of the Chairman that you review each of the attached documents and be prepared to discuss salient points in them during the currently scheduled 2-3 April meeting.

3 Inclosures
a/s

Clyde D. Gasser
CLYDE D. GASSER
Colonel, USAF
Secretary
Scientific Advisory Board
Office of the Chief of Staff

MEMBERS

Paul A. Smith (Chairman)
C. T. Elvey
Bernhard Haurwitz
Robert E. Holzer
William W. Kellogg
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ABSTRACT OF COMMENTS ON GEOPHYSICS PANEL
ACTIVITY BY B. HAURWITZ

A summary of environmental sciences data and information of significant interest to the Air Force is contained in the Geophysics Research Directorate of AFCRC "Handbook of Geophysics for Air Force Designers." This document is based on present knowledge up to 1957. A second edition is being prepared. Future editions should reflect the rapid increase of the extent of knowledge anticipated as a result of probes by aero-space vehicles. The role of the GRD leadership and functions of AF research work in this field is discussed in the panel memo dated February 1959. The panel should continue a close relationship with the GRD activity through further meetings at this installation.

The Air Force Office of Scientific Research has apparently agreed with GRD to sponsor astronomical investigations, and leave geophysics research to GRD. Panel cognizance of the AFOSR program should be maintained.

The panel should frequently check the use made of new knowledge by the Air Weather Service.

The impact of NASA activities appears to have created many organizational and administrative problems for SAB concern. The Geophysics Panel should insure that this newly created agency does not adversely affect the functioning of GRD. A specific problem in this connection is the study of terrestrial meteorology from satellites being investigated by various agencies. Special attention might be given to this problem as an example of how smooth (or not) the cooperation is between different agencies.

An additional problem, previously considered by the panel, but in need of renewed investigation, is the training of Air Force personnel to meet growing Air Force requirements in geophysics and space physics. The progress of this training should be investigated.

Incl 1

A. ENVIRONMENTAL SCIENCES

In aid of identifying a program of most meaningful advanced guided missile and military space system experimentation and development, an urgent need exists for extended and/or new physical data throughout the earth's atmosphere and beyond into space. Examples include the precise identification of all environmental conditions (magnetic, gravitation, radiation, density, propagation, etc.), the construction of an accurate model of the atmosphere, accurate orbit determination and prediction techniques, precise atmospheric re-entry phenomena determinations and, accurate (real time) space vehicle detection and surveillance techniques. An additional area of interest is that of further study of infrared and other unique methods of sensing of man-made objects within and beyond the atmosphere. An appropriate sounder-prober vehicle program on behalf of these determinations should be identified together with the necessary scope and nature of sophisticated payload equipment and instrumentation required for atmospheric, space and surface environmental investigations.

MEMORANDUM OF THE GEOPHYSICAL PANEL TO THE SCIENTIFIC ADVISORY BOARD, USAF

FEBRUARY 1959

The Geophysical Panel has visited various facilities of the Air Force and the ARDC - the Office of Scientific Research, the Geophysical Research Directorate, and AWS, talking over their various problems, plans and goals. In terms of exploratory research and directed research, the Air Force clearly has an extremely fine asset in the Geophysical Research Directorate of the Air Force Cambridge Research Center. This Directorate has grown to considerable size and a great deal of effectiveness during the last several years. Its activities financially involve something like a $5,000,000 yearly budget in the maintenance of in-house activities and something in the order of $20,000,000 in terms of contractual activities. There are approximately 500 people operating in-house of which about 6/10 or more are technical people, some of extremely high research scientific ability; GRD occupies now about 100,000 square feet of building space most of which is becoming consolidated in the Bedford Air Force Base area although some of it is still left behind in Boston and even some in Cambridge. It is the Air Force's largest investment in this directed activity and includes a very large amount of contractual activity that the Geophysical Research Directorate has built up over the years in many universities and other

Incl 3

research scientific organizations over the country.

GRD has shown a great deal of competence and ability to deal with crash programs, in basic research programs, and in directed research programs. Some of their activities should be mentioned: their original work in balloons; their important contribution to the development of numerical weather forecasting; extremely valuable research work in photo-chemistry; the measurement of upper atmospheric day and night sky radiations; creation of an ionosphere on the one hand and a very practical contrail suppression on the other hand; they have shown foresight in preparing for such problems as Geoid heights and they were ready with techniques for the WS 117L program. Here we believe that 6 out of 7 major experiments were essentially "off of the shelf." Also in the ARGUS test they were ready at very quick notice with some very fine equipment. I think, therefore, that the Panel's task with regard to GRD is more to discuss problems of the Air Force in maintaining this very strong facility, than in critical analysis of programs.

It appears that about 90% of GRD's total activity is research directed to specific goals which have been laid down by the Air Force; about 10% is purely exploratory research. This problem of defining precisely what is supporting or directed research and what is exploratory research is almost insoluble. In geophysics the Panel believes that practically

all of the research is pertinent to specific needs of the Air Force, either current needs or subsequent needs.

We are extremely pleased to see that the Air Force is appreciating more and utilizing to a very great extent the ability and skills of this group. During the last year or two particularly, possibly somewhat as a result of this panel's recommendations and possibly in the natural course of events in planning new systems, the Air Force and its contractors have made a practice of coming to the Geophysical Research Directorate to find out about geophysical parameters or phenomena that might affect the operations of new systems; unfortunately, some years ago there were some systems devised which rather ignored the presence of phenomena and problems in the high atmosphere.

The Panel has considered very carefully the Stever Committee report with regard to its application to the GRD facility. It appears that this report is extremely apt. The problems discussed there involving research people in connection with the Air Force are very well exemplified in GRD. Only in very minor points does the Panel find deviations or disagreements. One of these points is the suggestion in the report of separating exploratory research from directed or applied research in the general administrative organization of the Air Force. It is difficult to predict how much those recommendations will be followed in detail but the

Panel feels that a complete segregation of exploratory research from supporting research would be an error in principle, at least for geophysics. Much depends, too, upon the top-level organization in the government with regard to space research, a critical area to the Air Force and an area in which the Air Force has contributed a great deal. I think that any detailed discussion of these problems would be futile at this time. Whatever may be done with regard to meteorological satellites the Panel feels that the Air Force strength in these areas should be increased, whether or not by their own research. In GRD there were proposals that involved meteorological satellites and proposals that involved solar observing satellites. Those projects had been cancelled. There is strong competence in GRD to interpret the data from such satellites so that results can be utilized effectively by the Air Force in its systems plannings, general future planning, and in operations. The communication lines should be kept strong so that GRD can carry out these vital functions.

A second question of considerable significance and difficulty concerns the question of project monitoring by people who are doing research. If contracts are let in exploratory or supporting research by people who are not in the field of research, it is doubtful if their judgment can be as good as that of those who are in the field. If, however, the contracts are under control of those who are doing

research in the field there is the possibility that there may be competition between the people who are letting the contracts and those who carry out the research. It is very difficult to balance the losses that may occur from such competition against the advantages that occur by having the people who are responsible for the research contracts actively aware of the borderlines of the unknown in the area, and to know where to find a scientist to whom a necessary piece of supporting research is indeed an area of exploratory research that he is delighted to conduct. This has been the general approach of GRD in letting contracts in geophysical research. We find an unwritten rule, or an agreed upon mode of operation, that whenever a purely geophysical research proposal comes into the hands of the AFOSR it is passed on to the Air Force Cambridge Research Center, the Geophysical Research Directorate; the decision as to its validity and its granting is then made there. Whatever the disadvantages and advantages of the present system, the Panel feels that any sudden change in overall policy might have severe disadvantages.

Another possible weakness in the present system of letting contracts involves the development of young minds in geophysics. The ONR, for example, appears to have a more liberal policy in letting contracts so that graduate students can perhaps be trained somewhat more than through contracts from GRD. On the other hand, it is very impressive to note

the large number of theses in geophysics that have developed in the universities directly through contracts with GRD. In view of the dearth of trained men in the field of atmospheric sciences the Panel feels that all possible leniency by the Air Force in the letting of research contracts at the universities should be allowed in order to make it possible for the scientists to have as much independence as possible in picking and training students and in their own research.

GRD, we think, has suffered from the complexity mentioned in the Stever Committee report, paper work of getting permission to conduct research and in granting contracts. The Panel feels strongly that means can be taken to alleviate the difficulty and to give more freedom to research people; more trust. In the long run, regardless of contract monitoring, etc., the value of research depends upon the ability and integrity of the research man. It is doubtful if any amount of monitoring can increase the efficiency or value of scientific results and such monitoring can easily maim the spirit of research. Because of various difficulties mentioned in the Stever Committee report, the very fine organization, GRD, has had very serious difficulties. The financial problems of a year ago have left marked effects. Very recently a change in the directorship has served to disturb certain areas of the Directorate, adding to the general problems. The Panel feels that if the Air Force does

indeed prize GRD (and we think that it is a remarkably good facility) and if ARDC wishes to see GRD continue as an effective back-up in geophysics for the Air Force in its new Space role and in AICBM, ARDC should make every effort to handle the present situation carefully and sympathetically. It is particularly necessary that ARDC register clearly its confidence and faith in the organization. At the moment there is a great deal of doubt among the staff (particularly among the more able people) as to whether their efforts are being appreciated and real doubt as to whether GRD can continue as an effective research organization. This doubt is now coupled with a dearth of manpower in geophysics. Hence offers are pouring in from all directions for opportunities to do research at other institutions. If ARDC does not prize this fine facility sufficiently to take every care in looking out for its immediate future, to register as much appreciation as possible for what it has accomplished and to spell out the future security of the organization, the chances of GRD's remaining a strong organization full of able people who can do work of the highest competence in geophysics are relatively low. The Panel stresses the importance of maintaining strength in GRD, because of its value to the Air Force and the importance of maintaining it regardless of how geophysical research, satellite research, and other space research may be conducted throughout the Defense Department and throughout

the nation.

The Panel has noted with strong approval the general policy of the Air Force in training its personnel, in allowing personnel -- civilian personnel -- to obtain advanced scientific training. This, as the Stever Committee report states, has been a very fine effort but it still must be augmented to be sufficient for the needs; we hope that this program can be broadened and extended to the limits possible.

With regard to the AWS, the Panel notes with considerable interest and general approval that AWS has already been warned that its future requirements will involve not only predictions of weather and general meteorological conditions, but will also involve the corresponding types of activity with regard to operations in space. The AWS is cognizant of this coming need and is making plans to prepare itself for the coming space age so that it can grow naturally into an organization which provides the immediate information required for missions in space. The Panel notes the present dearth of AWS officers familiar with the needs of space operations and suggests that the Air Force extend its practice of sending AWS officers to qualified institutions for graduate study. This method has been very successful in connection with advanced meteorological training and should be expanded to include astrophysics and geophysics, not only for AWS officers but for other promising

AF officers.

Presented for the Geophysical Panel at the SAB meeting, Ramey AFB, October 22, 1958, by the Chairman.

FRED L. WHIPPLE (CHAIRMAN)

Fred L. Whipple

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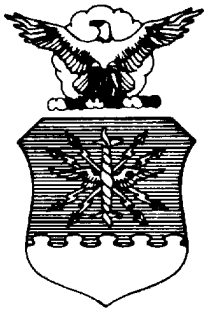

GENERAL BOARD MEETING
11-12 April 1963
Space Systems Division
Air Force Systems Command
Inglewood, California

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